

Investigation of the Bluffs Apartment Fire



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Introduction

I was originally retained by Ray Weber at Mills Meyers Swartling and then by Chris Betke at Coughlin Betke LLP to investigate a fire that occurred on December 31, 2015 at an apartment building located at 2 West Casino Rd, Everett, Washington. The fire resulted in the death of Mark Davis, injuries to several more, and substantial damage to multiple units.

Credentials and Bases for Opinions

I am a Principal Engineer with Colwell Consulting where I specialize in the engineering analysis of thermal and combustion processes, with specific expertise and experience investigating the cause and origin of fires and explosions. I have a Bachelor of Science in Mechanical Engineering from the University of Wyoming, a Master of Science in Mechanical Engineering from Purdue University, a Master of Science in Engineering from Stanford University and a Doctor of Philosophy in Mechanical Engineering from Arizona State University. I am a registered Professional Mechanical Engineer in the states of Arizona (#31176) and California (#M32037). Attached as Appendix A is a true and correct copy of my curriculum vitae. Attached as Appendix B is a summary of my testimony for the past four years. I am over 18 years of age. Colwell Consulting is being compensated at a rate of \$490/hr. for my time on this matter.

My opinions in this matter are based upon:

- 1) My education, training, and experience;
- 2) My evaluation of case material, including photographs, witness statements, and various reports;
- 3) My personal inspection of the building on June 16, 2016;
- 4) My personal inspection of evidence retained from the fire scene on August 25, 2016.

I reserve the right to amend or supplement these opinions should additional information become available. I also expect to have supplemental opinions after expert reports and depositions



provide additional detail on the allegations and the foundations upon which plaintiffs' experts' opinions are based.

Materials Reviewed

The following materials were reviewed and considered in forming my opinions. I may have supplemental opinions should additional information become available:

Documents

- 1 Everett Fire Department Reports
- 2 Everett Police Department Reports
- 3 Property Information
- 4 Discovery
- 5 Second Floor
- 6 James McCall Fire Inspector Report dated February 2, 2016
- 7 The Bluffs at Evergreen Apartment Homes Information
- 8 Death Certificate for Mark Davis
- 11 Michael Eskra CV
- 12 Fire Department Audio Interviews
- 13 911 Audio
- 15 Media Reports
- 21 CASE Forensics Inspection Protocols
- 24 Email Correspondence
- 26 Cover Letters
- 27 Darren Slee (Case Forensics) Notes
- 28 DJP Notes
- 29 Evidence Lists and Custody Documents
- 30 Insurance File
- 32 Lease Inspection and Work Orders
- 33 Property Overview
- 34 Sheriff (Case Forensics) Notes
- 35 Inspection Sign-In Sheets

Photographs

- 9 Radiograph Photograph dated February 3, 2016
- 14 Internet Photographs of Scene
- 16 Scene Photographs
- 17 YouTube Videos of Scene
- 18 Full Resolution Photographs of Scene taken by CASE
- 19 Video Interview with Lynn Yevrovich
- 20 Scene Photographs by K.T. Wood
- 22 X-Ray Images of the Exemplar Unit



- 23 Don Galler Inspection Photographs dated August 25, 2016
- 25 Case Forensics Evidence Photos
- 36 Undated Radiographs

Expert Reports

- 10 Scott Thomas Aerial Measurement Report dated January 21, 2016
- 31 Jensen Hughes Report dated December 18, 2018
- 37 Donald Galler Report dated July 15, 2021
- 38 Quinn Horn Report dated July 15, 2021

Fire Background

On the evening of December 31, 2015, a fire occurred at an apartment complex located at 2 West Casino Rd, Everett WA.¹ At approximately 7:10 p.m. Lynn Yevrovich, a tenant of unit E101, called 9-1-1 and reported the fire. During this call, Lynn Yevrovich said that her roommate, Mark Davis, was drunk and that he just set a fire. She also told the 9-1-1 operator that his mattress was on fire.² In the 9-1-1 recording, Ms. Yevrovich can be heard telling Mr. Davis repeatedly that they have to exit the apartment. She also tells the operator that he is drunk and not listening.³ While Ms. Yevrovich safely exited the apartment, Mr. Davis did not and was found deceased in the hallway leading to the entrance of unit E101 after the fire was extinguished.⁴ A sketch of unit E101 is shown in Figure 1. Photographs of the damage caused by the fire to unit E101 are shown in Figure 2 through Figure 6. The fire also caused varying degrees of damage to multiple nearby units in Building E.

At the scene, Ms. Yevrovich told Officer Ryan Hanks that she knew her roommate had started the fire and that he had fallen asleep earlier with a lit cigarette, which he did frequently. She went on to tell officers that she had seen smoke coming from his bedroom and, when she went

¹ NFIRS Report 2015-00304080, pg. 1

² 9-1-1 Call 304080 #1a

³ 9-1-1 Call 304080 #1b

⁴ Everett Fire Department Incident Report, pg. 9



to investigate, she saw the mattress on fire and Mr. Davis on the floor. She attempted to wake him but he would not get up, so she eventually left to call for help.⁵

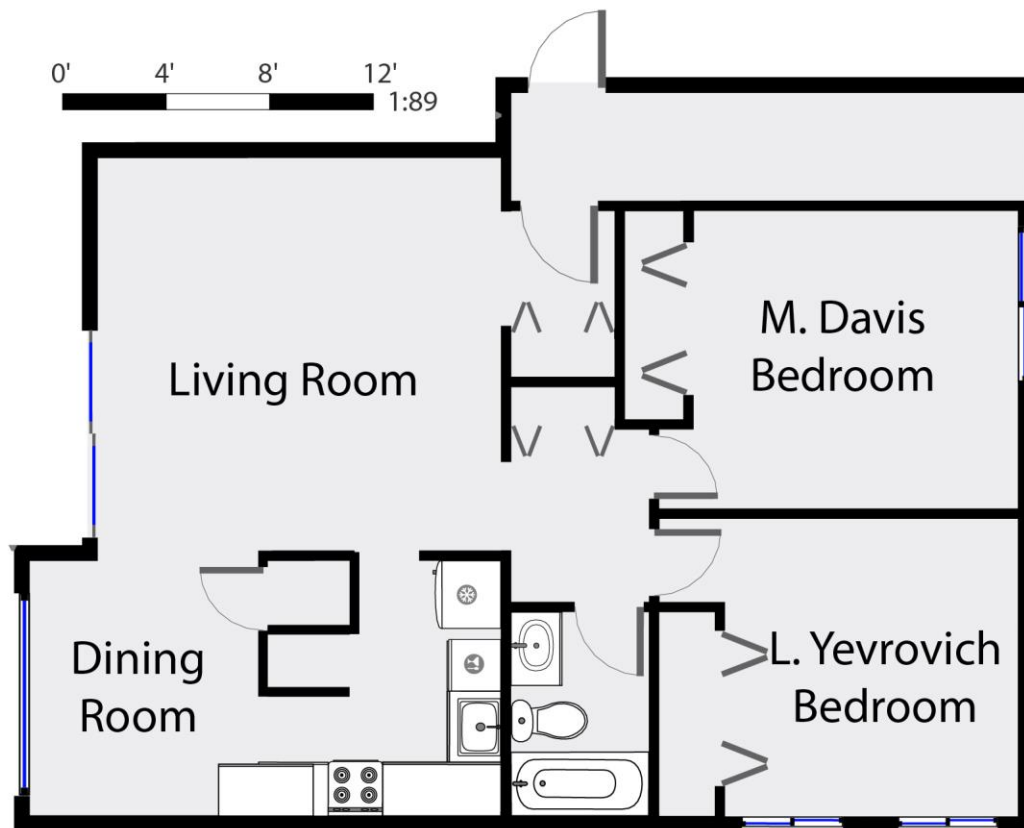


Figure 1 Sketch of unit E101.

⁵ Everett Police Department report, pg. 14





Figure 2 Living room in unit E101.



Figure 3 Dining room in unit E101.





Figure 4 Kitchen in unit E101.



Figure 5 Lynn Yevrovich's bedroom in unit E101.





Figure 6 Mark Davis's bedroom, as viewed through the window, in unit E101.

During an interview on January 6, 2016, Ms. Yevrovich stated to police that she and Mr. Davis had been dating. On the day of the fire, she ended the romantic nature of their relationship and informed him that she would be moving out, which he was upset about. She further stated that Mr. Davis had received his government assistance check that morning, that he had been drinking all day, and that she smelled cigarette smoke.⁶ She told investigators that later she was in the living room when she smelled smoke prompting her to go to Mr. Davis's room to investigate. At that point she saw white smoke billowing around the door. When she opened the door, she saw Mr. Davis standing in the middle of his room staring at the mattress, laundry, blankets, and other "stuff"⁷ on fire. She then grabbed the phone, called 9-1-1, and reported that the mattress was on fire.⁸

⁶ Everett Police Report, pg. 38

⁷ L. Yevrovich statement dated Jan. 6, 2016, time 4:00 – 4:25 (Transcript pg. 9)

⁸ L. Yevrovich statement dated Jan. 6, 2016, time 2:40 – 3:15 (Transcript pg. 7)



Fire department investigators conducted a limited scene excavation of Mr. Davis's bedroom after the fire was extinguished. As a part of this excavation, several components were identified, including: remnants of a computer, a power cord, and an outlet with a severed power cord still plugged in. After the fire department excavation, CASE Forensics (now a part of Jensen Hughes) documented and excavated Mr. Davis's room. As a part of this excavation, several additional components were identified, including: a power strip with multiple items plugged into it, a laptop with a severed power cord, a severed power cord plugged into an outlet, and several batteries. A sketch showing the locations of various items found during excavation, when they were first photographed, is shown in Figure 7. Locations at which wires exhibited evidence of beading are indicated with an open red circle in this figure.



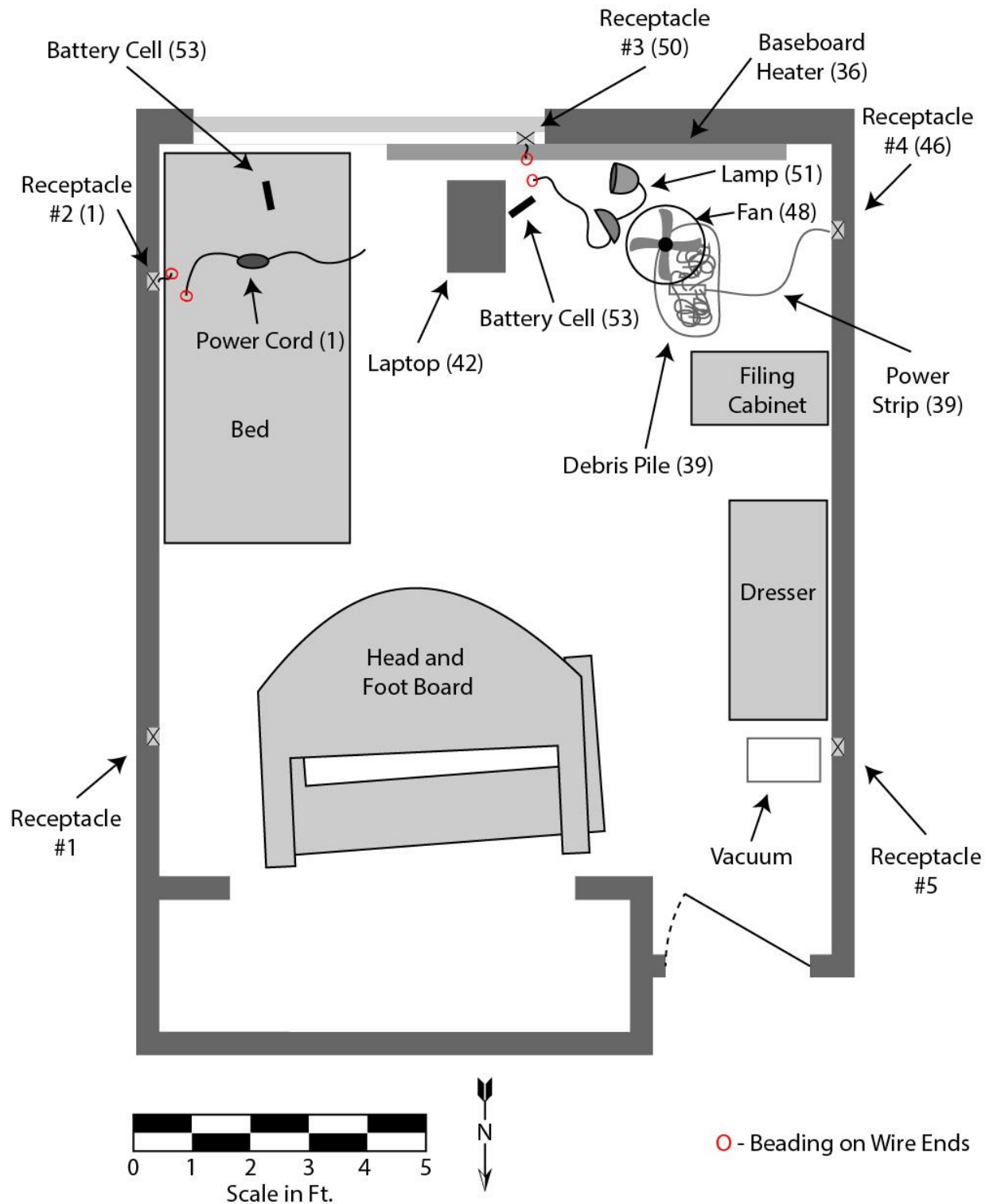


Figure 7 Sketch of Mr. Davis's bedroom and various items identified during excavation.



Fire Cause and Origin Opinions

1. As shown in Figure 2 - Figure 6, the structure sustained significant burn damage. The apartment was fully involved with burn damage down to the floor level throughout the unit.
2. Once a compartment, like Mr. Davis's bedroom, reaches full room involvement, burn patterns that existed initially that may have been useful in definitively determining the origin of the fire become degraded and can even become completely obliterated.
 - a. Section 18.4.1.4 of NFPA 921 (2021) states: "...*Determination of what patterns were produced at the point of origin by the first item ignited usually becomes more difficult as the size and duration of the fire increases. This is especially true if the compartment has achieved full room involvement.*"
 - b. It is well known that variations in burn damage are dependent of many factors other than the location that the fire originates. Section 18.4.1.3 of NFPA 921 (2021) states: "***Pattern Generation.*** *The investigator should not assume that the fire at the origin burned the longest and therefore fire patterns showing the greatest damage must be at the area of origin. Greater damage in one place than in another may be the result of differences in thermal exposure due to differences in fuel load, the location of the fuel package in the compartment, increased ventilation, or fire-fighting tactics...*"
3. Consistent with the guidelines in NFPA 921 (2021), Chapter 18, for determination of fire origin, I developed numerous fire origin hypotheses. The most relevant hypotheses that will be considered in detail in this report are that the fire originated:
 - a. Within Mr. Davis's bedroom in unit E101;
 - b. At some location within unit E101, other than Mr. Davis's bedroom.
4. Using the scientific approach outlined in NFPA 921 (2021), Chapter 18, I then tested each of the hypotheses I developed.



5. The hypothesis that the fire originated at some location within unit E101, other than Mr. Davis's bedroom, should be rejected.
 - a. When Yevrovich first observed the fire, she reported to the 9-1-1 operator that the fire was in Mr. Davis's bedroom. She later indicated to investigators that Mr. Davis's mattress, laundry, blankets, and other "stuff"⁹ was on fire.
 - b. Ms. Yevrovich describes seeing smoke coming from Mr. Davis's bedroom, which is what prompted her to investigate the source of the smoke.
 - c. As shown in Figure 1, in order to see into Mr. Davis's room, Ms. Yevrovich would have had to have been standing in the hallway, near the center of the apartment. Therefore, Ms. Yevrovich would have had the opportunity to observe fire burning in other locations of the apartment but she did not. Instead, she only reported fire within Mr. Davis's bedroom.
 - d. As a result, I rejected the hypothesis that the fire originated at some location within unit E101 other than Mr. Davis's bedroom.
6. The hypothesis that the fire originated within Mr. Davis's bedroom in unit E101 cannot be rejected.
 - a. As described in Paragraph 5 above, Ms. Yevrovich reported to 9-1-1, and then later to fire investigators, that the fire was first observed burning in Mr. Davis's bedroom within unit E101.
 - b. The burn damage sustained to the contents of the bedroom were severe. This burn damage was similar to or greater than burn damage in other locations within unit E101.

⁹ L. Yevrovich statement dated Jan. 6, 2016, time 4:00 – 4:25 (Transcript pg. 9)



- c. As a result, the hypothesis that the fire originated within Mr. Davis's bedroom in unit E101 cannot be rejected.
- 7. A smaller area of origin within Mr. Davis's bedroom is not supported by the physical evidence or the available witness statements.
 - a. The fire reached flashover, or full-room involvement, within Mr. Davis's bedroom and the window broke out well before it was extinguished. In fact, this bedroom window broke out as Ms. Yevrovich was on the phone with the 9-1-1 operator to report the fire.
 - b. As described in Paragraph 2 above, burn patterns that existed initially that may have been useful in definitively determining the origin of the fire were degraded or even completely obliterated before the fire was extinguished. As a result, determination of a specific point of origin within Mr. Davis's bedroom based on the physical evidence is not plausible for this particular fire.
 - c. Furthermore, while the fire was observed by Ms. Yevrovich, it is not clear the extent to which her field of view was blocked by the door or Mr. Davis. Additionally, it is unclear if she took the time to scan all of Mr. Davis's room to determine what other locations had already burned or were still burning when she observed the mattress on fire. Therefore, a determination of a specific point of origin within Mr. Davis's bedroom, based on the eyewitness testimony, is not plausible for this particular fire.
- 8. Consistent with the scientific methodology described in NFPA 921 (2021), the hypothesis that the fire originated within Mr. Davis's bedroom in unit E101 was accepted.
 - a. A more definitive area of origin is not supported by the available physical evidence or eyewitness observations.



9. Consistent with the scientific method described in NFPA 921 (2021), to determine the cause of the fire I then developed numerous fire cause hypotheses as described in section 19.5 of NFPA 921 (2021).
10. Numerous possible ignition sources may have been within Mr. Davis's bedroom at the time of the fire. The most relevant hypotheses that will be described in detail in this report are:
 - a. A deliberate act;
 - b. Smoking material;
 - c. An electrical fault associated with a lamp power cord;
 - d. An electrical fault associated with the laptop power cord;
 - e. The laptop;
 - f. The laptop lithium-ion batteries.
11. Consistent with section 19.6 of NFPA 921 (2021), these potential fire cause scenarios should then be tested.
 - a. **19.6 Testing the Cause Hypothesis for Validity.** *"Each of the alternate hypotheses that were developed must then be tested using the scientific method. If one remaining hypothesis is tested using the scientific method and is determined to be probable, then the probable fire cause is identified."*
12. When testing fire cause hypotheses, NFPA 921 (2021) warns investigators to attempt to disprove a hypothesis as opposed to attempting to confirm it.
 - a. **19.6.4 Means of Hypothesis Testing.** *"When testing a hypothesis, the investigator should attempt to disprove, rather than to confirm, the hypothesis. If the hypothesis cannot be disproved, then it may be accepted as either possible or probable."*



Hypothesis testing may include any application of fundamental principles of science, physical experiments or testing, cognitive experiments, analytical techniques and tools, and systems analysis.”

13. When selecting the final cause hypothesis, it is important that the facts support the cause determination to the exclusion of all other reasonable causes, as described in section 19.7 of NFPA 921 (2021).

- a. **19.7 Selecting the Final Cause Hypothesis.** *“Once the hypotheses regarding the “cause” of the fire have been tested, the investigator should review the entire process to ensure that all credible data are accounted for and all credible alternate causes have been considered and eliminated. When using the scientific method, the failure to consider alternate hypotheses is a serious error. A critical question to be answered by fire investigators is, “Are there any other cause hypotheses that are consistent with the data?” The investigator should document the facts that support the cause determination to the exclusion of all other reasonable causes.”*

14. In situations in which fire cause hypotheses only rise to the level of possible and cannot be disproven, the proper classification for the fire is that the cause is undetermined. An undetermined fire cause is a recognized and proper classification according to NFPA 921 (2021).

- a. **19.6.5.1 Cause Undetermined.** *“In circumstances where all hypotheses have been rejected, or if two or more hypotheses cannot be rejected, the only choice for the investigator is to conclude that the fire cause, or specific causal factors, is undetermined. It is improper to base hypotheses on the absence of any supportive evidence. That is, it is improper to opine a specific fire cause, ignition source, or fuel that has no evidence to support it even though all other such hypothesized elements were eliminated.”*

- b. **19.7.4 Undetermined Fire Cause.** *“The final opinion is only as good as the quality of the data used in reaching that opinion. If the level of certainty of the opinion is*



only “possible” or “suspected,” the fire cause is undetermined. This decision as to the quality of data and level of certainty of the opinions rests with the investigator.”

15. The hypothesis that the fire was a deliberate act cannot be rejected.

- a. Just hours prior to the fire, Ms. Yevrovich told Mr. Davis that she was ending her relationship with him and that she was moving out. Mr. Davis was very angry about this and reportedly yelled “Fuck you” at her several times before going into his bedroom.
- b. Revenge is one of the primary motives for intentionally set fires. Redsicker and O’Connor (1986) state: *“Arson motivated by revenge, spite, and jealousy accounts for a high percentage of the number of intentionally set fires occurring in the U.S. Those who commit such arson include ‘jilted lovers, feuding neighbors, disgruntled employees, quarreling spouses, persons getting even after being cheated or abused, and persons motivated by racial or religious hostility’ (Boudreau et al., 1977).”* Therefore, Mr. Davis could have been motivated to intentionally set the subject fire.
- c. Ms. Yevrovich stated numerous times to numerous investigators that she suspected that Mr. Davis had intentionally set the fire.
 - i. In the 9-1-1 audio, Ms. Yevrovich states on two separate occasions that Mr. Davis set the fire.
 - ii. Ms. Yevrovich stated to Officer Ryan Hanks: *“I know my roommate started this fire.”*¹⁰
 - iii. She wrote in a written statement that: *“Mark lit the mattress on fire.”*¹¹

¹⁰ Everett Police Department report, pg. 12

¹¹ Everett Police Department report, pg. 26



- iv. She stated to investigators in a recorded statement that she thought his frame of mind was: *“She’s leaving me. I hate her. I don’t want to live anymore. I’m going to set this place on fire and burn up everything she has...”*¹²
- v. She stated to investigators in a recorded statement that: *“He’d set the mattress fire”*¹³
- d. Ms. Yevrovich stated to investigators that Mr. Davis had a zippo lighter and butane to refill it in his room.¹⁴
- e. As shown in Figure 8, a fill canister of fuel was found in an open dresser drawer in Mr. Davis’s room by the Everett Police Department.
- f. A lighter of this style and the associated fluid could have been used to start a fire in his bedroom.
- g. As a result, the hypothesis that the fire was a deliberate act cannot be rejected.

¹² L. Yevrovich statement dated Jan. 6, 2016, time 50:10 – 50:45 (Transcript pg. 74)

¹³ L. Yevrovich statement dated Jan. 6, 2016, time 14:50 – 15:00 (Transcript pg. 24)

¹⁴ L. Yevrovich statement dated Jan. 6, 2016, time 43:55 – 44:10 (Transcript pg. 65)





Figure 8 Fill canister of fuel found in an open dresser drawer in Mr. Davis's room.

16. The hypothesis that smoking material was the cause of the fire cannot be rejected.

- a. Ms. Yevrovich stated to investigators that Mr. Davis smoked cigarettes and that she had smelled cigarette smoke earlier.¹⁵ She also stated to investigators that Mr. Davis had fallen asleep earlier with a lit cigarette and frequently smoked in bed.¹⁶
- b. Ms. Yevrovich stated that she observed both the mattress and bedding/clothing in the room on fire. Both of these fuels are receptive to cigarette ignition and lit cigarettes are a leading cause of home fires.

¹⁵ Everett Police Department report, pg. 38

¹⁶ Everett Police Department report, pg. 12



- i. Babrauskas (2003) states: “*Cigarettes are the most common form of ignition which occurs with upholstered furniture and beds; it is also a common source of ignition for a wide variety of other fires.*”
- ii. Ahrens (2019a) states: “*Fires started by smoking materials have been the leading cause or one of the leading causes of home fire fatalities for decades. This was still true for the 2013-2017 period as a whole.*”
- iii. Statistics on the first material ignited by smoking materials during the 2012-2016 time frame illustrate that bedding is the second most commonly ignited material behind trash or waste (Ahrens, 2019b).
- c. A cigarette butt was discovered within Mr. Davis’s room, as shown in Figure 9. This cigarette butt was not found within a proper container for cigarette disposal. I cannot rule out that it was improperly disposed of and, therefore, a possible ignition source for the fire.
- d. As a result, the hypothesis that smoking material was the cause of the fire cannot be rejected.





Figure 9 Cigarette butt discovered in Mr. Davis's room.

17. The hypothesis that an electrical fault associated with the lamp cord was the cause of the fire cannot be rejected.

- a. The location of the electrical fault associated with the lamp cord is shown in Figure 7.
- b. As shown in Figure 10 and Figure 11, both ends of the lamp cord copper conductors exhibit evidence consistent with electrical arcing. This arcing could have acted as an ignition source for the fire or it could have been the result of arcing-through-char once the fire occurred.
- c. Ms. Yevrovich stated in her interview that she saw other things burning, besides the mattress, in Mr. Davis's room, including laundry, blankets, and other "stuff"¹⁷ This

¹⁷ L. Yevrovich statement dated Jan. 6, 2016, time 4:00 – 4:25 (Transcript pg. 9)



observation is consistent with this electrical arc igniting this other material and then spreading to the mattress.

- d. As a result, the hypothesis that an electrical fault associated with the lamp cord was the cause of the fire cannot be rejected.

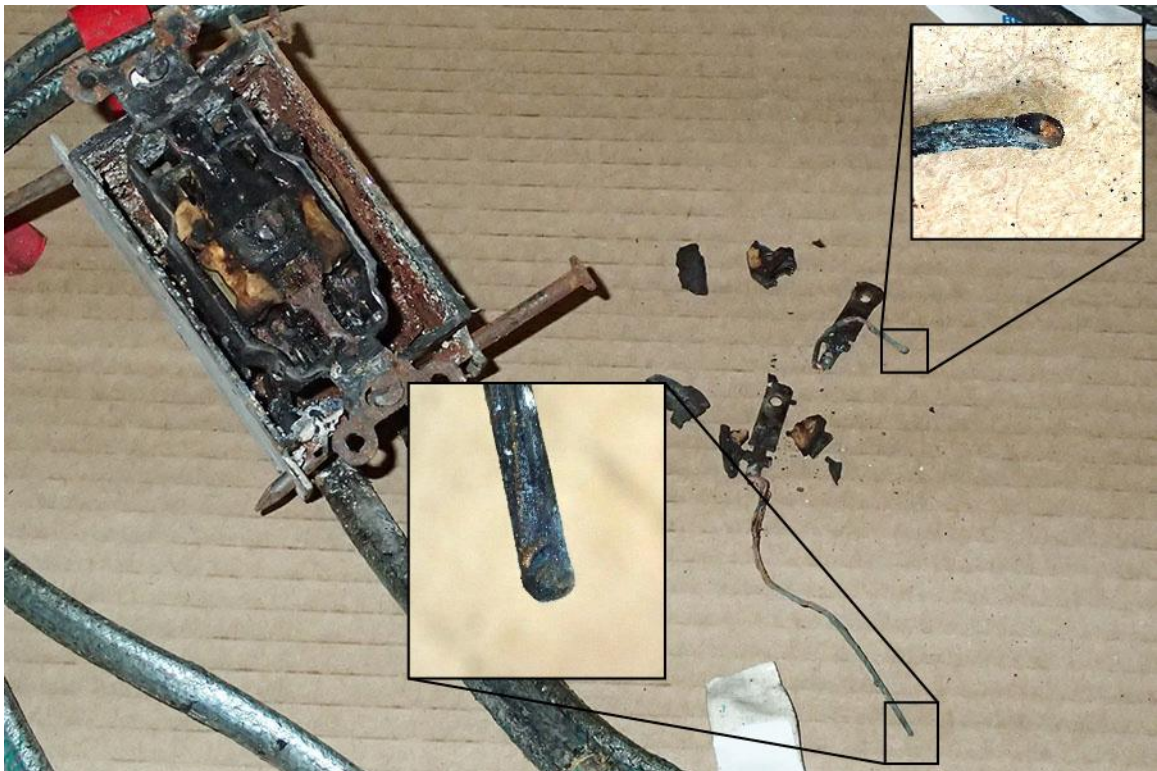


Figure 10 Receptacle #3 and associated fragmented power cord (Item #50).



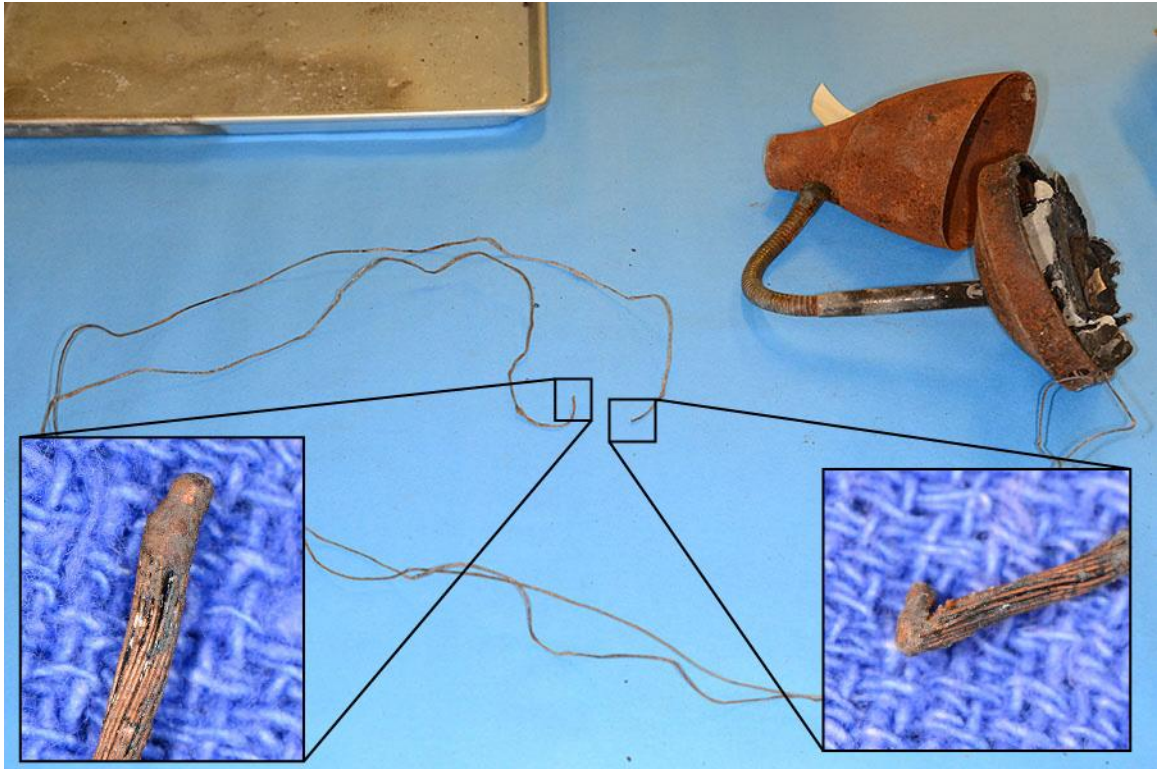


Figure 11 Lamp and associated power cord fragment (Item #51).

18. The hypothesis that an electrical fault associated with the laptop power cord was the cause of the fire cannot be rejected.
- a. The location of the electrical fault associated with the laptop power cord is shown in Figure 7.
 - b. As shown in Figure 12 and Figure 13, both tips of the ends of the power cord exhibit evidence consistent with electrical arcing. Note that in Figure 12, the ground pin on the right side of this photograph is associated with the 3-prong male plug in the receptacle. Therefore, this arc is at the end of two wires coming from the plug to the transformer. This arcing could have acted as an ignition source for the fire or it could have been the result of arcing-through-char once the fire occurred.
 - c. Ms. Yevrovich stated that she observed the mattress burning when she observed the fire. This observation is consistent with the fire originating on the mattress or other



combustible items that may have been nearby, including laundry, blankets, and other “stuff.”¹⁸

- d. The location of this arc is mid-span and as a result, is not involved in the creation of the electrical terminations that are present on both of the ends of this conductor. Based on available photographs of the initial excavation, performed by the fire department, it is unclear if this power cord may have been pinched between the frame of the bed and the box spring. If so, this pinching may have damaged the power cord and caused an electrical fault.
- e. As a result, the hypothesis that an electrical fault associated with the laptop power cord was the cause of the fire cannot be rejected

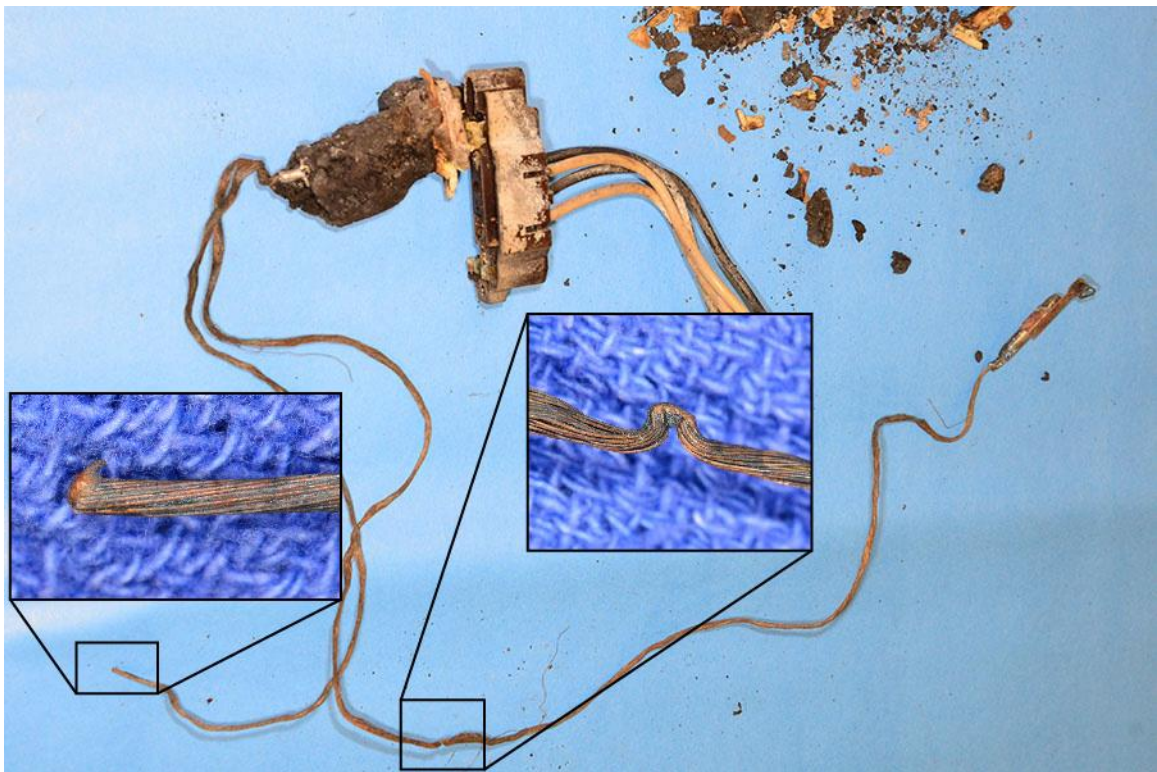


Figure 12 Receptacle #2 and associated power cord fragment (Item #1).

¹⁸ L. Yevrovich statement dated Jan. 6, 2016, time 4:00 – 4:25 (Transcript pg. 9)



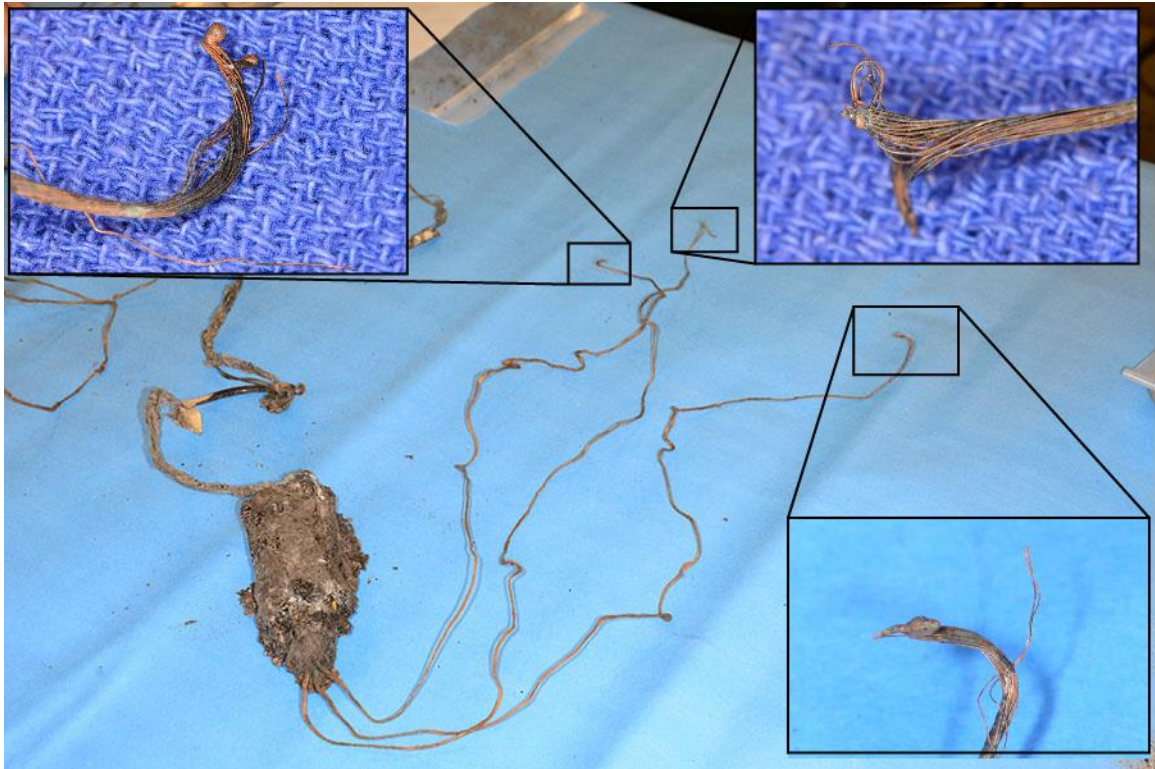


Figure 13 Power cord fragment found under the mattress (Item #1).

19. In his report dated July 15, 2021, Mr. Donald Galler evaluated the laptop as a potential cause of the fire. Mr. Galler ultimately concluded: *“The electrical evidence shows that the HPI computer, battery back or AC adapter were not the cause of the fire.”*¹⁹ I incorporate herein by reference Mr. Galler’s opinion regarding this fire cause hypothesis.

20. In his report dated July 15, 2021, Dr. Quinn Horn evaluated the lithium-ion batteries within the laptop as a potential cause of the fire. Dr. Horn ultimately concluded: *“It is my opinion that the alleged HP laptop computer, and associated lithium-ion battery components recovered from the fire scene at the Bluffs at Evergreen apartments did not initiate the fire. Rather, the evidence that I have reviewed is consistent with the lithium-ion cells in this*

¹⁹ Donald Galler report, dated July 15, 2021, pg. 31



computer failing as a result of exposure to heat from an encroaching fire.”²⁰ I incorporate herein by reference Dr. Horn’s opinion regarding this fire cause hypothesis.

21. As described above, there is compelling circumstantial evidence that the subject fire was deliberately set by Mr. Davis. However, because there are numerous other ignition source hypotheses that could not be disproven, consistent with NFPA 921 guidelines, including section 19.6.5.1 of NFPA 921 (2021), the cause of the fire is undetermined.

Response to Jensen Hughes Opinions

On December 18, 2018, Ken Rice and Andrew Paris authored a report entitled: “*The Bluffs at Evergreen Fire Investigation Report.*” The following paragraphs highlight my responses to the opinions expressed in this report. Because there are two authors and it is unclear which expert will testify, this report will be referred to as the “Jensen Hughes” report in the paragraphs below.

Jensen Hughes Fire Origin Opinions

22. The Jensen Hughes report concludes that the fire originated near the mattress in Mr. Davis’s room, stating: “*The witness statements, fire pattern analysis, electrical arcing analysis, and the results of the evidence examinations showed that the fire originated on the bed in the southeast quadrant of the southeast bedroom.*”²¹ The Jensen Hughes report goes on to state that: “*The fire originated on the bed in the southeast bedroom of Apartment E101.*”²² Jensen Hughes then provides the basis for this opinion in Paragraphs 1-6 on pages 20-22 of their report. Paragraphs 23-27 below contain a summary of my responses to these opinions and the associated bases.

23. In Paragraph 1, Jensen Hughes quotes from section 18.12 of NFPA 921, which states there are: “*four main factors that are used to determine the origin of a fire: a) Witness*

²⁰ Quinn Horn report, dated July 15, 2021, pg. 4

²¹ Jensen Hughes report, dated December 18, 2018, pg. 20

²² Jensen Hughes report, dated December 18, 2018, pg. 30



*Information and/or Electronic Data, b) Fire Patterns, c) Fire Dynamics and d) Arc Mapping”*²³

- a. This section of the Jensen Hughes report refers to the wrong section in the 2017 edition of NFPA 921. The correct section is 18.1.2.
- b. In the current 2021 edition of NFPA 921(2021), Arc Mapping has been dropped as one of the four main factors to determine fire origin.

24. In Paragraph 2, the Jensen Hughes report claims that Lynn Yevrovich stated: “*There was a fire on the mattress*” and “*The fire spread up the wall.*”²⁴

- a. This statement is incomplete and misleading.
- b. Ms. Yevrovich never entered into Mr. Davis’s room.²⁵ Therefore, both the bedroom door and Mr. Davis himself may have been blocking her view of the room. As a result, she may have been unable to see all of the contents of the bedroom that were burning. Furthermore, Ms. Yevrovich may not have taken the time to assess everything in the bedroom that was on fire.
- c. Ms. Yevrovich did not witness the fire in its incipient stages. In fact, Ms. Yevrovich referred to the fire when she first saw it as: “*It was big and hot. It was hot, so...*”²⁶
- d. Ms. Yevrovich also stated in her interview that she saw other things burning in Mr. Davis’s room, including laundry, blankets, and other “stuff.”²⁷

²³ Jensen Hughes report, dated December 18, 2018, pg. 20

²⁴ Jensen Hughes report, dated December 18, 2018, pg. 20

²⁵ L. Yevrovich statement dated Jan. 6, 2016, time 3:15 – 3:25 (Transcript pgs. 7-8)

²⁶ L. Yevrovich statement dated Jan. 6, 2016, time 3:20 – 3:30 (Transcript pg. 8)

²⁷ L. Yevrovich statement dated Jan. 6, 2016, time 4:00 – 4:25 (Transcript pg. 9)



- e. Therefore, Ms. Yevrovich's 911 call and statements do not support the Jensen Hughes opinion that the fire originated on Mr. Davis's bed. Other fire origin locations within Mr. Davis's room cannot be ruled out, as described in Paragraphs 6-8 above.

25. In Paragraph 3, the Jensen Hughes report states that: "*The fire patterns in the southeast bedroom showed that the heaviest fire damage occurred in the southeast quadrant.*"²⁸ They go on to state: "*The bed and box spring were fire damaged and charred down to floor level.*"²⁹

- a. The Jensen Hughes report misinterprets the burn patterns within Mr. Davis's bedroom, and in particular, the burn damage to the bed and box spring, and the fact that the damage extended down to the floor level.
- b. The subject fire was extinguished well after the room reached flashover and full-room involvement. Section 18.4.1.3 of NFPA 921 (2021) specifically warns against assuming that the area with greatest burn damage was the area of origin:
 - i. "**18.4.1.3 Pattern Generation** *The investigator should not assume that the fire at the origin burned the longest and therefore fire patterns showing the greatest damage must be at the area of origin. Greater damage in one place than in another may be the result of differences in thermal exposure due to differences in fuel loading, the location of the fuel package in the compartment, increased ventilation, or fire-fighting tactics. For similar reasons, a fire investigator should consider these factors when there is a possibility of multiple origins.*"
- c. In this case, the mattress was one of the largest fuel loads in the room and it was located directly beneath a large window that burst while the fire was being reported

²⁸ Jensen Hughes report, dated December 18, 2018, pg. 20

²⁹ Jensen Hughes report, dated December 18, 2018, pg. 21



to 9-1-1. As described by section 18.4.1.3.1 and section 18.4.1.4 of NFPA 921 (2021), in this circumstance, greater damage in this location would be expected, regardless of where in the room the fire originated.

- i. **18.4.1.3.1** *“The size, location, and heat release rate of a fuel package may have as much effect on the extent of damage as the length of time the fuel package was burning. An area of extensive damage may simply mean that there was a significant fuel package at that location. The investigator should consider whether the fire at such a location might have spread there from another location where the fuel load was smaller.”*
- ii. **“18.4.1.4 Ventilation.** *Ventilation, or lack thereof, during a fire has a significant impact on the heat release rate and consequently on the extent of observable burn damage. The analysis of fire pattern data should, therefore, include consideration that ventilation influenced the production of the pattern. Ventilation-controlled fires tend to burn more intensely near open windows or other vents, thereby producing greater damage. Knowledge of the location and type of fuel is important in fire pattern analysis. During full room involvement conditions, the development of fire patterns is significantly influenced by ventilation. Full room involvement conditions can cause fire patterns that developed during the earlier fuel-controlled phase of the fire to evolve and change. In addition, fires can produce unburned hydrocarbons that can be driven outside the compartment through ventilation openings. This unburned fuel can mix with air and burn on the exterior of the compartment, producing additional fire patterns that indicate the fire spread out of the original compartment. Thus, knowledge of changes in ventilation (e.g., forced ventilation from building systems, window breakage, opening or closing of doors, burn-through of compartment boundaries) is important to understand in the context of fire pattern analysis. Determination of what patterns were produced at the point of origin by the first item ignited usually*



becomes more difficult as the size and duration of the fire increases. This is especially true if the compartment has achieved full room involvement.”

- d. As a result, the fire patterns were not properly interpreted by Jensen Hughes. The burn patterns that they refer to do not support the conclusion that the fire originated at the mattress to the exclusion of all other locations in Mr. Davis’s room.

26. In Paragraph 5, Jensen Hughes uses arc mapping as a basis for their fire origin opinion, stating: *“Often an arcing event will trip an overcurrent protective device (OCPD) such as a circuit breaker or fuse. In some cases, the arcing event may completely sever the conductor(s). If the initial arcing event doesn’t trip the OCPD or sever the circuit, the circuit will remain energized and it could then arc at another location. Based on this general principle, the furthest downstream arcing event (i.e. away from the source of the power) would have been damaged/attacked by fire first.”*³⁰ They go on to state that: *“The arcing on the laptop power supply AC line cord was the furthest downstream arcing found in the room of fire origin, based on the routing of the circuit. This arc mapping evidence correlates with the witness statements and burn patterns that showed the fire originated on the bed in the southeast quadrant.”*³¹

- a. The authors of the Jensen Hughes report have a fundamental misunderstanding of how arc-mapping can be used. The correct use of arc mapping is described by section 6.3.21.6 of NFPA 921 (2021) which states:

- i. **6.3.21.6 Multiple Arc Sites on One Circuit.** *“There is one situation where documented arc sites may be used to draw an additional conclusion beyond those previously cited. If there is a sever arc site on a circuit and other arc site(s) downstream of that location, then the arcing at the sever arc site had to occur simultaneously or after downstream arcs, since arcing cannot occur*

³⁰ Jensen Hughes report, dated December 18, 2018, pg. 21

³¹ Jensen Hughes report, dated December 18, 2018, pg. 22



once circuit continuity is lost (assuming the downstream arcs are not otherwise energized beyond the severing arc)."

- ii. This is illustrated in Figure 14 (Colwell, 2018). In this figure, a sever-arc has occurred at location 1 due to arcing-through-char that did not trip the circuit breaker. This means that additional arcing can no longer occur at location 2. However, an additional sever-arc could occur at arc location 3 and this could imply the direction of fire travel.
 - iii. However, in Mr. Davis's bedroom, the two arcs occur on two different power cords. Power cords that are plugged into different receptacles, even if on the same branch circuit, are independent of each other, and therefore an arc severing event on one does not preclude an arcing event on the other. As a result, since one of these arc events did not result in the loss of electrical power to the other arc location, arc mapping cannot be used.
- b. Furthermore, section 6.3.21.6.1 of NFPA 921 (2021) specifically states that the approach that Jensen Hughes used is incorrect.
- i. **6.3.21.6.1** *"Note that the situation described in 6.3.21.6 is NOT equivalent to concluding that "arcing moves upstream towards the power source." The latter is an erroneous assumption and not supported by science. A direction can only be imputed if there is a sever arc mark and an arc site(s) downstream of the sever arc mark."*
- c. Additionally, section 6.3.21.7 of NFPA 921 (2021) goes on to state that arcing is not more prevalent near the area of origin.
- i. **6.3.21.7** *"Research specifically disproves the concept that arcs will be more prevalent at the area of origin, compared to other locations."*



- d. Therefore, arc mapping does not support Jensen Hughes' origin determination. Instead, Jensen Hughes has used an approach that is incorrect and counter to that described by NFPA 921 (2021).

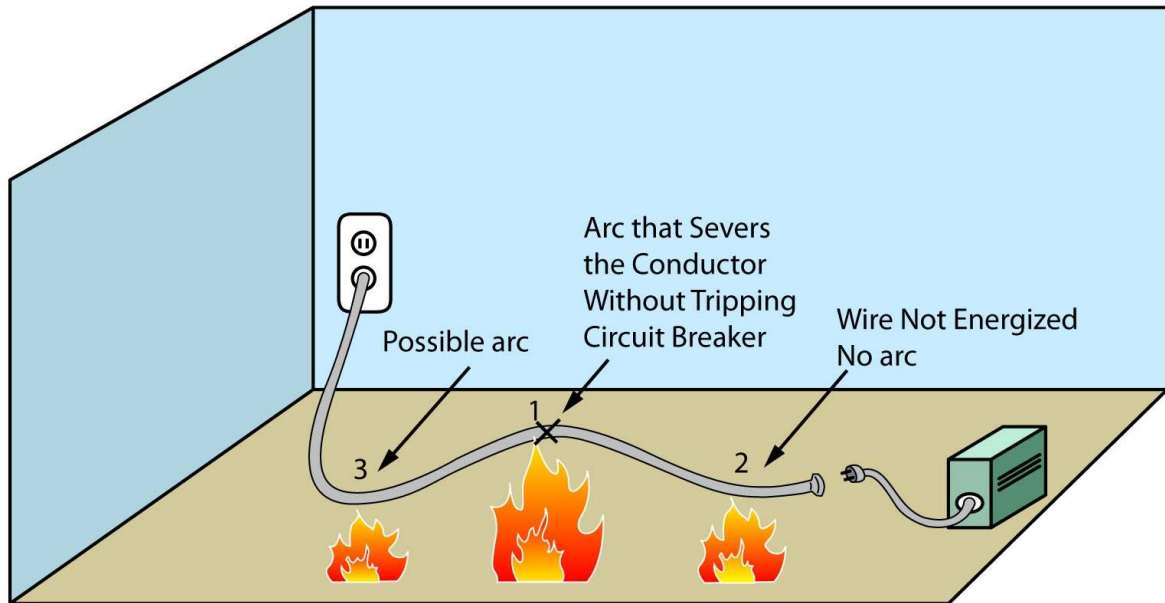


Figure 14 Schematic of arc mapping.

27. Overall, the approach that Jensen Hughes used in developing their fire origin opinion was counter to the scientific method described in NFPA 921 (2021). In particular, Jensen Hughes failed to develop and test various fire origin hypotheses. Furthermore, Jensen Hughes incorrectly interpreted the physical evidence in reaching their opinions. They failed to consider the effect of ventilation and fuel loading on the burn patterns associated with the combustible material, misinterpreted witness statements, and incorrectly interpreted arcing evidence in determining the area of origin. As a result, their opinion concerning the origin is without merit and is inconsistent with the scientific method, as outlined by NFPA 921 (2021).

Jensen Hughes Ignition Source Opinions

Overall, the approach that Jensen Hughes used to determine the cause of the subject fire was seriously flawed. The bases for rejecting important fire cause hypotheses, including electrical



arcing associated with the laptop and fan power cord, an intentionally set fire, and a cigarette butt, were speculative and not based on sound, scientific reasoning.

28. With respect to the cause of the fire, Jensen Hughes outlines three cause hypotheses: a) “*Mr. Davis intentionally ignited his mattress with and open flame*”³²; b) “*Mr. Davis fell asleep or passed out while smoking in bed*”³³; and, c) “*A failure of the subject HP laptop ignited the fire*”.³⁴ Ultimately, they reject the first two hypotheses and accept the last concluding that: “*The fire was caused by an internal failure of the HP laptop Li-ion battery pack that ignited surrounding combustible materials.*”³⁵ Jensen Hughes then provides the basis for this opinion in Paragraphs 1-6 on pages 22-29. Paragraphs 29 – 41 below contain a summary of my responses to these opinions and the associated bases.

29. In Paragraph 2, Jensen Hughes speculate that: “*It is therefore likely Mr. Davis was on the bed while he was in the room prior to the fire.*”³⁶

- a. There is no sound basis for this opinion. Mr. Davis could have been involved in any number of activities in his bedroom prior to the fire. The only evidence available concerning his pre-fire activities is Ms. Yevrovich’s statement that Mr. Davis was standing in the room when she observed the fire. Jensen Hughes’ opinion that he was on the bed prior to the fire is speculative and without merit.

30. In Paragraph 4, Jensen Hughes states: “*She stated that there were no linens/sheets on the bed, most likely because Mr. Davis often soiled the bed.*”¹⁸ *Although she said there may have been a blanket, she did not witness anything on the bed at the time of the fire.*¹⁹ *This*

³² Jensen Hughes report, dated December 18, 2018, pg. 22

³³ Jensen Hughes report, dated December 18, 2018, pg. 23

³⁴ Jensen Hughes report, dated December 18, 2018, pg. 25

³⁵ Jensen Hughes report, dated December 18, 2018, pg. 30

³⁶ Jensen Hughes report, dated December 18, 2018, pg. 22



*comports with Ms. Yevrovich's statements that Mr. Davis was clothed and wearing a down-filled coat at the time of the fire and would therefore have not needed a blanket."*³⁷

- a. These statements are misleading and speculative. Ms. Yevrovich offered conflicting statements about the bedding. At one point, she stated to investigators that she didn't remember if Mr. Davis had blankets on the bed.³⁸ She then later stated that she didn't see "anything" on the bed³⁹ but that she saw other things burning, besides the mattress, in Mr. Davis's room, including laundry, blankets and other "stuff."⁴⁰ Furthermore, as described in Paragraph 24 above, it is unclear what Ms. Yevrovich's field of view of the bedroom contents was and if she took the time to carefully look to see if and where any linens/sheets/blankets may have been at the time of the fire.

31. In Paragraph 6a, Jensen Hughes argues that Mr. Davis did not intentionally set his mattress on fire, stating: *"Mr. Davis had no reported history or allegations of intentionally igniting a fire before."*²⁰ *He had no reported suicidal tendencies, nor history of causing property damage."*²¹ *He and Ms. Yevrovich had fought in the past and she did not report previous property damage or violence against her. There is no reasoning or rationale that would explain this type of behavior by Mr. Davis."*⁴¹

- a. There is little information about whether or not Mr. Davis had ever intentionally set a fire. However, even if he hadn't, this doesn't mean that he could not have set the subject fire. To argue that Mr. Davis could not have set the fire because he never started an intentional fire in the past is flawed logic. The flaw in their logic is that every arsonist sets a first fire.
- b. As described in Paragraph 15 above, just hours prior to the fire, Ms. Yevrovich told Mr. Davis that she was ending her relationship with him and that she was moving

³⁷ Jensen Hughes report dated December 18, 2018, pg. 22.

³⁸ L. Yevrovich statement dated Jan. 6, 2016, time 33:00 – 33:06 (Transcript pg. 48)

³⁹ L. Yevrovich statement dated Jan. 6, 2016, time 33:07 – 33:15 (Transcript pg. 49)

⁴⁰ L. Yevrovich statement dated Jan. 6, 2016, time 4:00 – 4:25 (Transcript pg. 9)

⁴¹ Jensen Hughes report dated December 18, 2018, pg. 22



out. Mr. Davis was very angry about this and reportedly yelled “Fuck you” at her several times before going into his bedroom.

- c. Revenge is one of the primary motives for intentionally set fires, as described in Paragraph 15 above.
- d. Ms. Yevrovich stated numerous times to numerous investigators that she believed that Mr. Davis had intentionally set the fire, as described in Paragraph 15 above.
- e. As a result, there is no basis to reject the hypothesis that Mr. Davis intentionally started the subject fire as described by section 19.6.4 of NPFA 921 (2021) (see Paragraph 12 above). Therefore, the approach used by Jensen Hughes to reject this hypothesis was counter to the scientific method outlined in NFPA 921 (2021).

32. In Paragraph 6b, Jensen Hughes argues that the hypothesis that smoking material was the cause of the fire should be rejected. As described in the following paragraphs, this conclusion is not supported by the physical evidence and eye witness statements.

33. In Paragraph 6b, i, Jensen Hughes states: *“No used smoking materials (i.e. cigarette butts) were found within the area of origin, or in the debris from the area of fire origin that was processed during the investigation. Other than one old cigarette butt under the TV and an empty pack of cigarettes near the closet, there was no evidence of active, long term smoking in the bedroom, i.e. there were no ashtrays, butt cans, distrusted cigarette butts, etc. found in the bedroom.”*⁴²

- a. As described in Paragraph 22-27 above, there is no basis to conclude that the fire originated only on the mattress in Mr. Davis’s room. It could have originated in other locations. Therefore, claiming that a cigarette butt found in the room was outside the area is incorrect. This cigarette butt was within the area of origin and the

⁴² Jensen Hughes report dated December 18, 2018, pg. 23



recovery location is not justification to reject the hypothesis that smoking material was the cause of the fire.

- b. Furthermore, hose streams used during fire suppression could easily move a lightweight cigarette. Therefore, the cigarette butt may have been on the mattress at the time the fire initiated and then moved by hose streams to the location at which it was recovered.
- c. Jensen Hughes opinion above implies that only long-term use of cigarettes is required for a cigarette butt to be the cause of the fire. This is illogical. It only takes one carelessly discarded cigarette to cause a fire. If anything, the fact that there were no ashtrays, cigarette butt cans, etc. found in the room makes it more likely that the fire was caused by a cigarette butt as there were no containers available to safely discard a cigarette.
- d. Therefore, the location where the cigarette butt was found and the alleged lack of long term smoking in the room does not mean that the hypothesis that the cause of the fire was a cigarette butt can be rejected.

34. In Paragraph 6b, ii, Jensen Hughes states: “*Mr. Davis did not have a history of igniting fires while smoking in the past.*”⁴³

- a. There is little information about whether or not Mr. Davis had accidentally caused a fire due to smoking. However, even if he had not, this doesn’t mean that he could not have started the subject fire by smoking materials.
- b. Furthermore, Ms. Yevrovich stated to Officer Ryan Hanks that Mr. Davis had engaged in high-risk smoking, including falling asleep while smoking.

⁴³ Jensen Hughes report dated December 18, 2018, pg. 23



- c. Therefore, Mr. Davis's past smoking behavior is not justification to reject the hypothesis that the cause of the fire was a cigarette. To the contrary, his history supports it.

35. In Paragraph 6b, iii-v, Jensen Hughes argues that: a) if the fire was caused by a cigarette, Mr. Davis would have likely been asleep and, b) that if he was asleep with the fire started, that his clothes would have been burned and he would have been injured.

- a. Jensen Hughes speculates that Mr. Davis would have been asleep had the subject fire been caused by a cigarette butt. The fact is that Mr. Davis's activities prior to the fire are unknown. Furthermore, there is no basis to assume that if he was asleep, he would be burned and his clothing ignited before he woke up and moved away from the fire. He could have simply woken up for other reasons. Therefore, these speculative assumptions by Jensen Hughes do not support rejecting the hypothesis that the fire was caused by a cigarette butt.

36. In Paragraph 6b, vi, 1, Jensen Hughes argues that a fire caused by a cigarette butt would have been a slow, smoldering fire and that the timing of the smoke alarm activation and the observations of Ms. Yevrovich comport with a fast moving fire, stating: "*A slow smoldering fire produces smoke for an extended period due to its longer duration, and therefore the smoke detector would have been more likely to sound off earlier.*"⁴⁴

- a. This opinion is vague, speculative, and not supported by any data in the literature, calculations, or testing. The rate of fire growth and smoke production is complex and dependent on the exact configuration of the fuel load, ignition source, and ventilation. The only reference (FEMA, 2012) cited by Jensen Hughes in this section simply states that smoke detectors can detect smoke from a cigarette fire before they become deadly. It does not state that cigarette fires are "slow" while other fires are "fast."

⁴⁴ Jensen Hughes report dated December 18, 2018, pg. 23



- b. Furthermore, research on compartment fires with similar dimensions and fuel load typically do not have a constant fire growth, or heat release rate (DeHann and Icové, 2012). Instead, the rate of fire growth, or heat release rate, varies throughout the progression of the fire. Therefore, the terms “slow” and “fast” fire are inconsistent with known compartment fire dynamics.
 - c. The underlying premise to this opinion by Jensen Hughes is that a mattress fire ignited by the laptop or associated batteries would be “fast.” However, this is not necessarily the case. A full-scale burn test in the literature (DeHann and Icové, 2012) in which a mattress was ignited by a lighter in a bedroom resulted in a fire growth phase of more than 12 minutes. Therefore, a mattress fire is not necessarily “fast,” as assumed by Jensen Hughes.
 - d. Furthermore, the mattress may have been ignited by directly by numerous possible ignition sources or other first fuels ignited that could have been ignited by a cigarette. Therefore, the rate of fire growth cannot be used to determine the ignition source as it would have been the same for numerous ignition scenarios.
37. In Paragraph 6b, vi, 2-4, Jensen Hughes argues that Ms. Yevrovich’s observations support the notion that the fire was a “fast” fire and are counter to a “slow” fire. The premise to this argument is apparently that Ms. Yevrovich smelled smoke from the fire in its early stages and when she first saw the fire it was large.
- a. This premise is incorrect. As soon as Ms. Yevrovich smelled smoke she immediately went to investigate and saw the fire in Mr. Davis’s room. Therefore, Ms. Yevrovich’s observations do not provide any information on how fast the fire grew. She was looking at it at a single point in time. The observations of smoke, her ability to speak on the phone with 9-1-1 without coughing and whether or not Mr. Davis was shocked/confused to not provide any information about the ignition mechanism of the fire, including if that ignition mechanisms was a cigarette butt. Instead, these observations are coupled to the fuel packages that were burning at the time she observed the fire, and the associated production of heat and smoke.



38. In Paragraph 6b, vii-xv, Jensen Hughes argues that the fire safety standards for “fire-safe” cigarettes, implemented in 2011, and mattresses make ignition of bedding and mattress material an unlikely cause for the subject fire. They state, “*These [“fire-safe” cigarette] standards require that cigarettes contain safety provisions that cause them to go out if they are unattended.*”⁴⁵ They go on to state, “*Mattresses are difficult to ignite with a smoldering cigarette due to long-standing federal regulations on the flammability of mattresses. 16 CFR Part 1632, Standard for the Flammability of Mattresses and Mattress Pads, was introduced in 1973 and was designed to prevent and/or limit the ignition of mattresses from smoldering cigarettes.*”⁴⁶

- a. Even cigarettes rated as “fire-safe” can still smolder the entire length of the cigarette, as acknowledged by the Jensen Hughes report. Therefore, ignition of fires by cigarette butts have not been eliminated, in spite of fire safety standards for both cigarettes, mattresses and mattress pads. In fact, fatal residential fires attributed to cigarette butts have remained relatively constant from 2007 to 2016, in spite of the new “fire-safe” cigarettes, as shown in Figure 15 (Ahrens, 2019b).
- b. Therefore, as described in Paragraph 17 above, the hypothesis that the cause of the fire was a cigarette butt cannot be rejected. It is a well-known cause of residential fires.

⁴⁵ Jensen Hughes report dated December 18, 2018, pg. 24

⁴⁶ Jensen Hughes report dated December 18, 2018, pg. 24



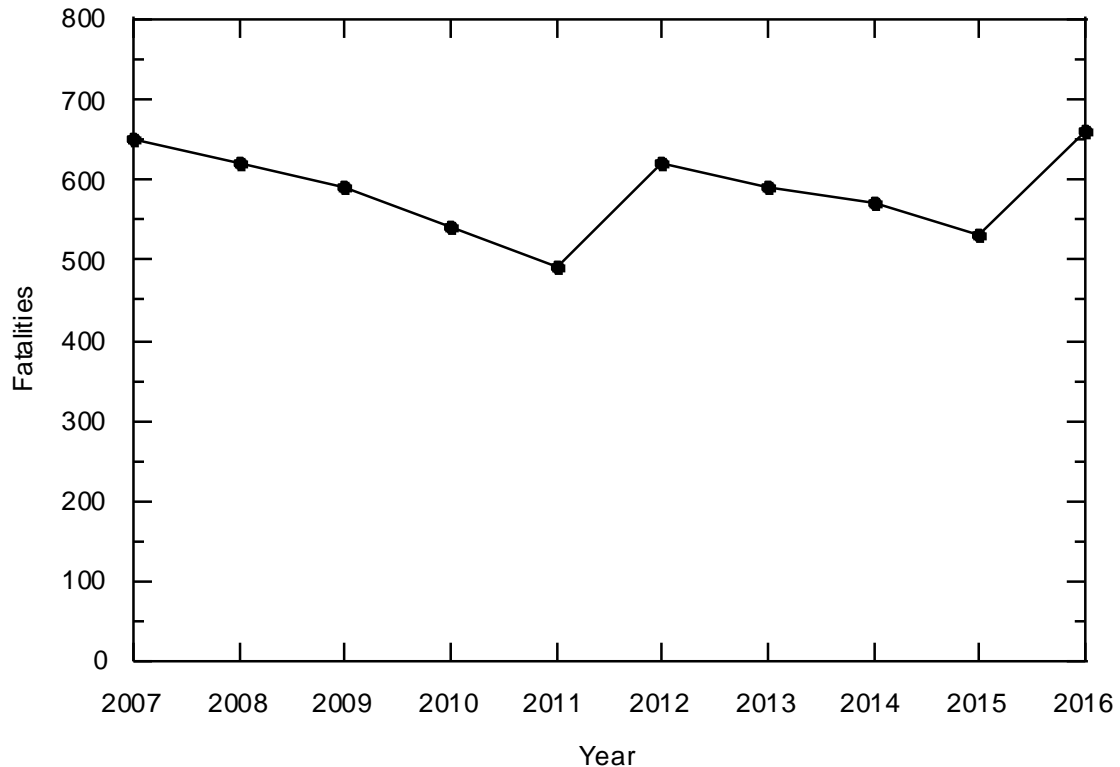


Figure 15 Fatal home structure fires started by smoking materials (Ahrens, 2019b).

39. In Paragraph 6b, xi, Jensen Hughes states “*Mr. (sic) Yevrovich noted that there weren’t sheets on the mattress. She said there may have been a blanket on the bed, but she didn’t note anything on the bed when she first observed the fire.*”

- a. As described in Paragraph 16.b above, Ms. Yevrovich stated that she observed both the mattress and bedding/clothing in the room on fire. Both of these fuels are receptive to cigarette ignition and lit cigarettes are a leading cause of home fires.

40. In Paragraph 6b, vii-x, Jensen Hughes references numerous internet links in footnotes 25-31. These internet links are no longer valid. Therefore, I may have supplemental opinions should these references, which formed the basis for the opinions expressed by Jensen Hughes, become available.

41. Overall, the approach that Jensen Hughes used to determine the cause of the subject fire was seriously flawed. The bases for rejecting important fire cause hypotheses, including



electrical arcing associated with the laptop and fan power cord, an intentionally set fire, and a cigarette butt, were speculative and not based on sound, scientific reasoning. The use of speculation and lack of sound scientific reasoning in rejecting various fire cause hypotheses was consistent with confirmation and expectation bias, which is specifically cautioned against by NFPA 921 (2021).

- a. Section 4.3.9 of NFPA 921 (2021) states, “**4.3.9 Expectation Bias.** *Expectation bias is a well-established phenomenon that occurs in scientific analysis when investigator(s) reach a premature conclusion without having examined or considered all of the relevant data. Instead of collecting and examining all of the data in a logical and unbiased manner to reach a scientifically reliable conclusion, the investigator(s) uses the premature determination to dictate investigative processes, analyses, and, ultimately, conclusions, in a way that is not scientifically valid. The introduction of expectation bias into the investigation results in the use of only that data that supports this previously formed conclusion and often results in the misinterpretation and/or the discarding of data that does not support the original opinion. Investigators are strongly cautioned to avoid expectation bias through proper use of the scientific method.*”

- b. Section 4.3.10 of NFPA 921 (2021) states, “**4.3.10 Confirmation Bias.** *Different hypotheses may be compatible with the same data. When using the scientific method, testing of hypotheses should be designed to disprove a hypothesis (i.e., falsification of the hypothesis), rather than relying only on confirming data that support the hypothesis. Confirmation bias occurs when the investigator relies exclusively on data that supports the hypothesis and fails to look for, ignores, or dismisses contradictory or nonsupporting data. The same data may support alternate and even opposing hypotheses. The failure to consider alternate or opposing hypotheses, or prematurely discounting seemingly contradictory data without appropriate analysis and testing can result in incorrect conclusions. A hypothesis can be said to be valid only when rigorous testing has failed to disprove the hypothesis. Disproving the hypothesis is a process in which all of the evidence is*



compared against the proffered hypothesis in an effort to find why the hypothesis is not true.”

Summary

On the evening of December 31, 2015, Lynn Yevrovich called 9-1-1 to report a fire in her roommate’s (Mark Davis) bedroom in unit E101 at 2 West Casino Rd., Everett, WA. During the 9-1-1 call, she stated that the mattress in Mr. Davis’s bedroom was on fire. She also stated that her roommate was drunk and set the fire. Ms. Yevrovich later told fire investigators that Mark Davis smoked and that he had fallen asleep earlier with a lit cigarette. Although Ms. Yevrovich can be heard telling Mr. Davis that they need to leave the apartment and she was able to escape the fire, Mr. Davis didn’t safely exit the building and was found deceased in the hallway leading to the apartment. Within Mr. Davis’s bedroom there were numerous possible ignition sources that may have caused the fire. While there is compelling circumstantial evidence that the subject fire was deliberately set by Mr. Davis, because numerous other ignition sources could not be ruled out, the cause of the fire is undetermined.

Overall, the process by which Jensen Hughes reached their conclusions was flawed and inconsistent with the scientific method as outlined in NFPA 921 (2021). In particular, Jensen Hughes incorrectly interpreted the physical evidence in reaching their fire origin opinions. They failed to consider the effect of ventilation and fuel loading on the burn patterns associated with the combustible material, misinterpreted witness statements, and incorrectly interpreted arcing evidence in determining the area of origin. The bases Jensen Hughes used for rejecting important fire cause hypotheses, including electrical arcing associated with the laptop and lamp power cord, an intentionally set fire, and a cigarette butt, were speculative and not based on sound, scientific reasoning. This approach was consistent with confirmation and expectation bias, which is counter to the scientific method and specifically cautioned against by NFPA 921 (2021).

References

Ahrens, M. (2019a) Home Structure Fires, National Fire Protection Association, Quincy, MA.



Ahrens, M. (2019b) Home Fires Started by Smoking – Supporting Tables, National Fire Protection Association, Quincy, MA.

Babrauskas, V. (2003) Ignition handbook. Fire Science Publishers, Issaquah, WA.

DeHann, J. D. and Icove, D. J. (2012) Kirk's Fire Investigation, Seventh Edition, Pearson, Boston, pg. 54-65.

FEMA (2012) Smoking-Related Fires in Residential Buildings (2008-2010), TFRS Vol. 13, Issue 6, June 2012.

NFPA 921 (2021) Guide for Fire and Explosion Investigations, National Fire Protection Association, Quincy, MA.

Redsicker, D. R. and O'Connor, J. J. (1986) Practical Fire and Arson Investigation, Second Edition, CRC Press, Boca Raton, pg. 20.



Appendix A





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Jeff Colwell, Ph.D., P.E.

Dr. Jeff Colwell is a Principal Engineer at Colwell Consulting where he specializes in the engineering analysis of thermal and combustion processes, especially the cause, origin, and propagation of fires and explosions. Dr. Colwell has investigated fires and explosions in a wide array of applications including motor vehicles, residential and commercial structures, wildfires, and industrial complexes associated with the chemical, drilling, refining, and mining industries. Technical issues addressed have included cause and origin determination, burn pattern interpretation, evaluation of ignition mechanisms, smoldering and self-heating, fire spread, smoke transport, smoke detector operation, building evacuation, fire department response, carbon monoxide poisoning, and lithium-ion battery performance. He also evaluates the design and performance of household appliances, heating and cooling equipment, and various other consumer products. Dr. Colwell's research has focused on fire dynamics, burn patterns, and forced ignition mechanisms, including spark (electrostatic) and hot-surface ignition of combustibles, as well as ignition mechanisms associated with various types of electrical components. He has also conducted research involving complex two-phase flows, liquid atomization, and droplet transport.

Prior to founding Colwell Consulting, Dr. Colwell was a Principal Engineer at Exponent where he worked for more than 18 years. Dr. Colwell also held research positions at AlliedSignal Aerospace, the Combustion Laboratory at Arizona State University, the High Temperature Gas Dynamics Laboratory at Stanford University, and the Thermal Sciences and Propulsion Center at Purdue University.

Education

Ph.D., Mechanical Engineering, Arizona State University
M.S., Engineering, Stanford University
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Registered Professional Mechanical Engineer, Arizona, #31176
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Fire Cause and Origin Investigation 1A and Techniques of Fire Investigation 1B accredited by the California State Fire Marshal; Vehicle Fire Cause and Origin Investigation Course; Fundamentals of Automotive Fuel Delivery Systems Course, Society of Automotive Engineers, and Advanced Cognitive Interviewing and Forensic Statement Analysis, Behavior Analysis Training Institute.

Professional Honors

Committee Chairman and Session Organizer: Fire Safety Sessions at SAE World Congress, Society of Automotive Engineers, 2008–2010.

Principal Member: Technical Committee on Recreational Vehicles, NFPA 1192: *Standard on Recreational Vehicles*, NFPA 1194: *Standard for Recreational Vehicle Parks and Campgrounds*, National Fire Protection Association, 2006–2019.

Pi Tau Sigma; Mortar Board; Omicron Delta Kappa
SAE Excellence in Oral Presentation Award, 2009 and 2010
SAE Lloyd L. Withrow Distinguished Speaker Award, 2012
Outstanding Research Award, Union Carbide Corporation, 1994

Book Chapters

Long, R.T., Colwell, J.D., Ray, R., Grossman, H.L., Thomas, B. and Strassburger, R. (2008) Passenger vehicle fires. In Cote, A.E. (Ed.), *Fire Protection Handbook*, 20th Edition. National Fire Protection Association, Quincy, MA, Vol. 2, Sect. 21, Chap. 1, pp. 21-3 – 21-14.

Publications

Knox, B.W., Papageorge, M., Colwell, J.D. (2020). Full-Scale Burn Test of a 2014 Sport Utility Vehicle. SAE Technical Paper 2020-01-0925.

Colwell, J.D., Knox, B.W. (2018) Full-Scale Burn Tests of Side-by-Side All-Terrain Vehicles. SAE Paper 2018-01-0279.

Papageorge, M. and Colwell, J.D. (2018) High-Performance Rear- and Mid-Engine Vehicle Exhaust System Temperatures. SAE Paper 2018-01-1436.

Colwell, J.D. and Henry, C.D. (2016) Full-Scale Burn Test of a 2007 Cargo Van. SAE Paper 2016-01-1403.

Colwell, J. D. (2015) Oxidation Patterns in Motor Vehicle Fire Investigations – Unraveling the Myths. *Fire and Arson Investigator*, January, 2015, 26-36.

Colwell, J.D. (2014) Full-Scale Burn Test of a 1998 Compact Passenger Car. SAE Paper 2014-01-0426.



- Colwell, J.D. (2013) Full-Scale Burn Test of a 2001 Full-Size Pickup Truck. *SAE Int. J. Trans. Safety* 1(2). Also in SAE Paper 2013-01-0214.
- Colwell, J.D. and Cundy, M. (2013) Full-Scale Burn Test of a 1992 Compact Pickup Truck. *SAE Int. J. Trans. Safety* 1(2). Also in SAE Paper 2013-01-0209.
- Colwell, J.D. and Babic, D. (2012) A Review of Oxidation on Steel Surfaces in the Context of Fire Investigations. *SAE Int. J. Passeng. Cars-Mech. Syst.* 5(2). Also in SAE Paper No. 2012-01-0990.
- Colwell, J.D. (2010) Ignition of Combustible Materials by Motor Vehicle Exhaust Systems - A Critical Review. *SAE Int. J. Passeng. Cars-Mech. Syst.* 3(1), 263. Also in SAE Paper No. 2010-01-0130.
- Colwell, J.D. and Biswas, K. (2009) Steady-State and Transient Motor Vehicle Exhaust System Temperatures. *SAE Int. J. Passeng. Cars-Mech. Syst.* 2(1), 206. Also in SAE Paper No. 2009-01-0013.
- Colwell, J.D., Mongia, R. and Reza, A. (2005) Case Study on Evacuation Rates within the World Trade Center Towers on September 11, 2001. 49th Annual Human Factors and Ergonomics Society Conference, Orlando, FL, September 26–30.
- Colwell, J.D. and Reza, A. (2005) Hot Surface Ignition of Automotive and Aviation Fluids. *Fire Technology*, 41(2), 105–123.
- Colwell, J.D. and Reza, A. (2003) Use of Soot Patterns to Evaluate Smoke Detector Operability. *Fire and Arson Investigator*, July, 2003, 42–45.
- Martin, R.J. and Colwell, J.D. (2003) De Novo VOC from Regenerative Thermal Oxidizers. ASME Summer Heat Transfer Conference, Paper No. HT2003-40557, Las Vegas, NV, July 21–23, 2003.
- Colwell, J.D., Korb, T.M. and Peck, R.E. (2002) Hot Surface Ignition of Jet-A Fuel by Conductive Deposits. *Proc. Combust. Inst.*, **29**, 297-303.
- Colwell, J.D. (2001) Hot Surface Ignition of Jet-A Fuel by Conductive Deposits, Ph.D. Dissertation, Arizona State University.
- Colwell, J.D. and Peck, R.E. (2001) Ignition of Jet-A Fuel by Silver Oxide Deposits. 18th International Colloquium on the Dynamics of Explosions and Reactive Systems, Seattle, WA, August 2001.
- Colwell, J.D. and Peck, R.E. (2001) Ignition of Jet-A fuel on Silver Oxide Deposits. 2nd Joint Meeting of the U.S. Sections of the Combustion Institute, Oakland, CA, March 2001.



Cooperrider, N.K., Hammoud, S.A. and Colwell, J.D. (1998) Characteristics of Soil-Tripped Rollovers. SAE Paper No. 980022.

Senser, D.W., Colwell, J.D. and Smith, R.M. (1995) An Experimental Study of the Structure of Supercritical Fluid and Conventional Air Paint Sprays. 22nd Waterborne, High-Solids, and Powder Coatings Symposium, pp. 161–170, New Orleans, LA, February, 1995.

Senser, D.W., Colwell, J.D. and Nielsen, K.A. (1994) An Experimental Study of Workpiece Interaction Regions and Impact Velocities of Supercritical Fluid Spray. 4th Annual ESD Advanced Coatings Technology Conference, pp. 369–379, Dearborn, MI, November 1994.

Senser, D.W., Colwell, J.D. and Nielsen, K.A. (1994) A Comparison Between the Structure of Supercritical Fluid and Conventional Air Paint Sprays. 7th Annual Conference on Liquid Atomization and Spray Systems, pp. 35–39, Bellevue, WA, May 1994.

Colwell, J.D., Senser, D.W. and Nielsen, K.A. (1993) Influence of Temperature on the Structure of Supercritical Fluid Coating Sprays. 24th Annual Meeting of the Fine Particle Society, Chicago, IL, August 1993.

Colwell, J.D. (1993) Influence of Pressure and Temperature on the Structure of Supercritical Fluid Coating Sprays, M.S. Thesis, Purdue University.

Colwell, J.D., Senser, D.W. and Nielsen, K.A. (1993) Influence on Temperature on the Structure of Supercritical Fluid Coating Sprays. 6th Annual Conference on Liquid Atomization and Spray Systems, pp. 39–43, Worcester, MA, May 1993.

Instructor

“Fundamentals of Motor Vehicle Fire Investigation” Society of Automotive Engineers, 2009–present.

“Vehicle Fire Investigation” California Conference of Arson Investigators, San Luis Obispo, California, November 10, 2010.

Editorships

Associate Editor, SAE International Journal of Passenger Cars – Mechanical Systems, 2010–present.

Peer Reviewer

- *Fire Technology*
- *Journal of Fire Sciences*
- SAE World Congress - Fire Safety Session



Appendix B



Jeff Colwell, Ph.D., P.E.

Testimony Summary

Depositions

Gil Ben-Kely and Craig Sherwood v Lamborghini et al., District Court, Clark County, Nevada, A-17-757614-C, April 6, 2021

Hayley Chacon and Alyssa Cleveland v Polaris, District Court, Clark County, Nevada, Case No.: A-18-772816-C, January 15, 2021.

Rossy Martinez v Nissan, United States District Court for the Southern District of Florida, Miami Division, Case No. 19-CV-2080-KMW, November 25, 2019

AMCO Insurance Company (Pemper) et al. v BMW of North America, United States District Court, Southern District of California, Case No. 3:19-cv-00024 H JLB, October 4, 2019.

Gregory and Julie Misner v Ford, Superior Court of the State of California, County of Los Orange, Case No. 30-2013-00668307 CU-BC-CXC, March 28, 2019.

Evelia Arroyo v Ford, Superior Court of the State of California for the County of Riverside – Palm Springs District, Case No. PSC1302130, February 28, 2019.

Richard Melton and Michelle Melton v Ford, Superior Court of the State of California in and for the County of San Diego, Case No. 37-2017-00018831-CU-BC-CTL, February 21, 2019.

Hein v Utility Trailer Manufacturing, State of New Mexico, County of Santa Fe, First Judicial District Court, No. D-101-CV-2016-01541, January 25, 2019.

Jeff Ettleman v Ford, Superior Court of the State of California for the County of San Bernardino, Case No. PSC1301934, December 13, 2018.

Shawn Nolan and Jerry Nolan v Ford, Superior Court of California, County of Riverside, Case No. RIC1307491, October 19, 2018.

State Farm (An) v Toyota, United States District Court for the Eastern District of Pennsylvania, Case No. 2:16-cv-04127-GEKP, October 5, 2018.

Hilda Bates v Tippman Sports et al., In the United States District Court for the Western District of North Carolina Charlotte Division, Case No. 3:16-CV-00875-GCM, September 10, 2018.

Raul Berroteran v Ford, Superior Court of the State of California, County of Los Angeles, Case No. BC542525, August 17, 2018.

Shelby Anderson and Tammy Anderson v Ford, Superior Court of the State of California for the County of San Joaquin, Case No. STK-CV-UBC-2013-0007198, August 16, 2018.

Wanda Lawrence, et al., v Daimler Trucks North America, Freightliner and Logistics Inc., In the Circuit Court of Cabell County, West Virginia, Civil Action No.: 11-C-757, June 14, 2018.

Western Enterprises, Inc. v Freudenberg et al., In the Court of Common Pleas, Cuyahoga County, Ohio, Case No. CV-869179, May 10, 2018.

Jennifer Pettitt v Husqvarna Consumer Outdoor Products and Denny Brooks Ford, In the District Court of Furnas County, Nebraska, Case No. C1 16-68, March 23, 2018.

Liberty Mutual Fire Insurance Co., et al. v BMW of North America, In the Circuit Court for Anne Arundel County, Maryland, No. C-02-cv-15-002872, February 15, 2018.

Mills v General Motors, United States District Court, District of South Carolina, Charleston Division, No. 2:17-CV-00201-RMG, September 27, 2017.

Daniel Fassett and Leslie Fassett v Bemis Manufacturing Company, et al., In the United States District Court for the Middle District of Pennsylvania, No. 4:15-cv-00941-MWB, August 22, 2017.

Lighthouse Property Insurance (Scott) v BMW of North America, United States District Court, Eastern District of Louisiana, No. 2:16-cv-14116, July 13, 2017.

FedEx Freight Vehicle Collision Cases, Superior Court of the State of California for the County of Los Angeles – Central Civil West, Judicial Council Coordination Proceeding No. 4788, May 16, 2017.

Scott Denson v U-Haul, et al., Superior Court of the State of California, County of Los Angeles, Case No.: BCC 532339, May 5, 2017.

Leading Insurance Group v Everbrite, et al., United States District Court, Central District of California, Western Division, No. 2:16-cv-02415-FMO-FMMx, March 16, 2017.

Trials

Hein v Utility Trailer Manufacturing, State of New Mexico, County of Santa Fe, First Judicial District Court, No. D-101-CV-2016-01541, August 22, 2019.

Liberty Mutual Fire Insurance Co. et al. v BMW of North America, In the Circuit Court for Anne Arundel County, Maryland, No. C-02-cv-15-002872, April 11, 2019.

Peterson v Hyundai Motor America, In the Fourth Judicial District Court in and for Utah County, Provo Department, State of Utah, Civil No. 160401657, February 15, 2019.

Wanda Lawrence, et al., v Daimler Trucks North America, Freightliner and Logistics Inc., In the Circuit Court of Cabell County, West Virginia, Civil Action No.: 11-C-757, August 21, 2018.